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June 11, 2003

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Commissioner for Patents  
P.O. Box 1450  
Arlington, VA 22313-1450

Re: Patent Application for:  
"Method for Annealing Ultra-thin, High Quality Gate Oxide Layers  
Using Oxidizer/Hydrogen Mixtures"  
Serial No.: 09/885,744  
Attorney Docket: TI-32705  
Our File: 50000.2188

Dear Sir:

Enclosed for filing please find the following items relating to the above-identified application:

- (1) Amendment Pursuant to 37 CFR § 1.115;
- (2) Replacement Pages; and
- (3) Postcards.

Please return the date-stamped postcards to the corresponding addresses as indicated. In the meantime, if you have any questions or comments concerning this matter, please call the undersigned. Otherwise, please accept the enclosed.

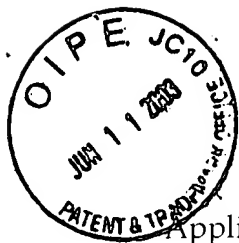
Respectfully submitted,

Gary C. Honeycutt

GCH:glc  
Enclosures

cc: W. James Brady, III (Texas Instruments Incorporated, w/ encls.)

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6-13-03



2823

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

#10/B  
6/19/3  
Jules

Applicant: Hiroaki Niimi

Examiner: Khiem D. Nguyen

Serial No.: 09/885,744

Art Unit: 2823

Filed: 06/20/01

Docket: TI-32705

For: METHOD FOR ANNEALING ULTRA-THIN, HIGH QUALITY GATE  
OXIDE LAYERS USING OXIDIZER/HYDROGEN MIXTURES

June 11, 2003

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Date of Deposit: June 11, 2003

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*Ginger Cox*  
Ginger Cox

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AMENDMENT PURSUANT TO 37 CFR 1.115

Sir:

Responsive to the Office Action of March 13, 2003, please amend the application as follows:

IN THE CLAIMS

Claim 1, at the end of line 6, add - then subsequently - ; at the end of line 8, add - subsequently - ; and line 11-12, delete "at minimum oxidation rate".

Claim 6, line 2, delete "(preferred 1%)."

Cancel Claim 8.

REMARKS

Favorable reconsideration and allowance of the application are respectfully requested, in view of the above amendments and the following comments.

The rejection of claims 1-13 as unpatentable over Huang et al. in view of Daniel et al. and Park et al. is respectfully traversed, since the references fail to disclose or suggest Applicants' invention as defined by the claims. Note specifically that the first embodiment of Huang's process begins with the use of N<sub>2</sub>O and H<sub>2</sub> to grow a gate dielectric consisting of silicon oxynitride. But in Applicants' process, only the final anneal step uses N<sub>2</sub>O and H<sub>2</sub>. This is a critical difference which makes the Huang et al. reference inapplicable.

Moreover, Huang's process forms a dielectric layer containing only 1-5 atomic % nitrogen (see Abstract, and claims 7, 19, 20 and 21); whereas Applicants' process forms a dielectric layer containing about 10 atomic % nitrogen (See Fig. 7).

Still further, Huang clearly teaches that his nitrogen content is not uniform. See paragraph 21 wherein the nitrogen content is stated to be 15 atomic % at the surface region, and 15 atomic % at the interface region; but the overall content is just 1-5 atomic %. Extremely non-uniform.

In the alternate embodiment of Huang, beginning with paragraph 22, the process begins with nitridation of the silicon substrate. This is not at all the same as nitridation of an oxide layer, as required by Applicants' claims.

Also, in the alternate embodiment of Huang, the subsequent step (which follows nitridation of silicon) forms an oxynitride layer between the nitrided silicon layer and the underlying silicon substrate. Consequently, Huang obtains a "much higher" nitrogen content at the dielectric top surface than at the lower levels (see paragraph 23).

In summary, Huang repeatedly and emphatically requires a non-uniform nitrogen content, while Applicants require a uniform nitrogen content. Applicants always begin with an oxide layer, followed by subsequent nitridation to form a uniform nitrogen content; whereas Huang never begins with an oxide layer.

Both procedurally and conceptually, the reference contradicts the essence of Applicants' invention!

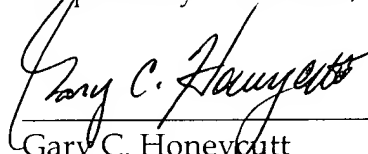
The rejection is therefore improper and should be withdrawn.

The secondary reliance on Daniel et al. to show uniform nitrogen distribution is improperly combined with Huang because the combination requires a total rejection of the essence of Huang. That is, one skilled in the art cannot logically rely on Daniel as a basis for selectively disregarding and/or disproving the essence of Huang, and then retaining everything else taught by Huang. Obviously, if there were any basis for totally refuting and ignoring the non-uniformity required by Huang, nothing else in Huang can still be relevant! One cannot destroy the essence of Huang, and continue to preserve and respect other features which are clearly dependent upon the original essence!

Similarly, the reliance upon Park et al. to show a capacitor is moot, since Park cannot change the flawed teaching of Huang; nor can Park cure the flawed effort to combine contradictory references (Huang and Daniel). The rejection is improper and should be withdrawn.

Applicants now believe the application is in condition for allowance.

Respectfully submitted,



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